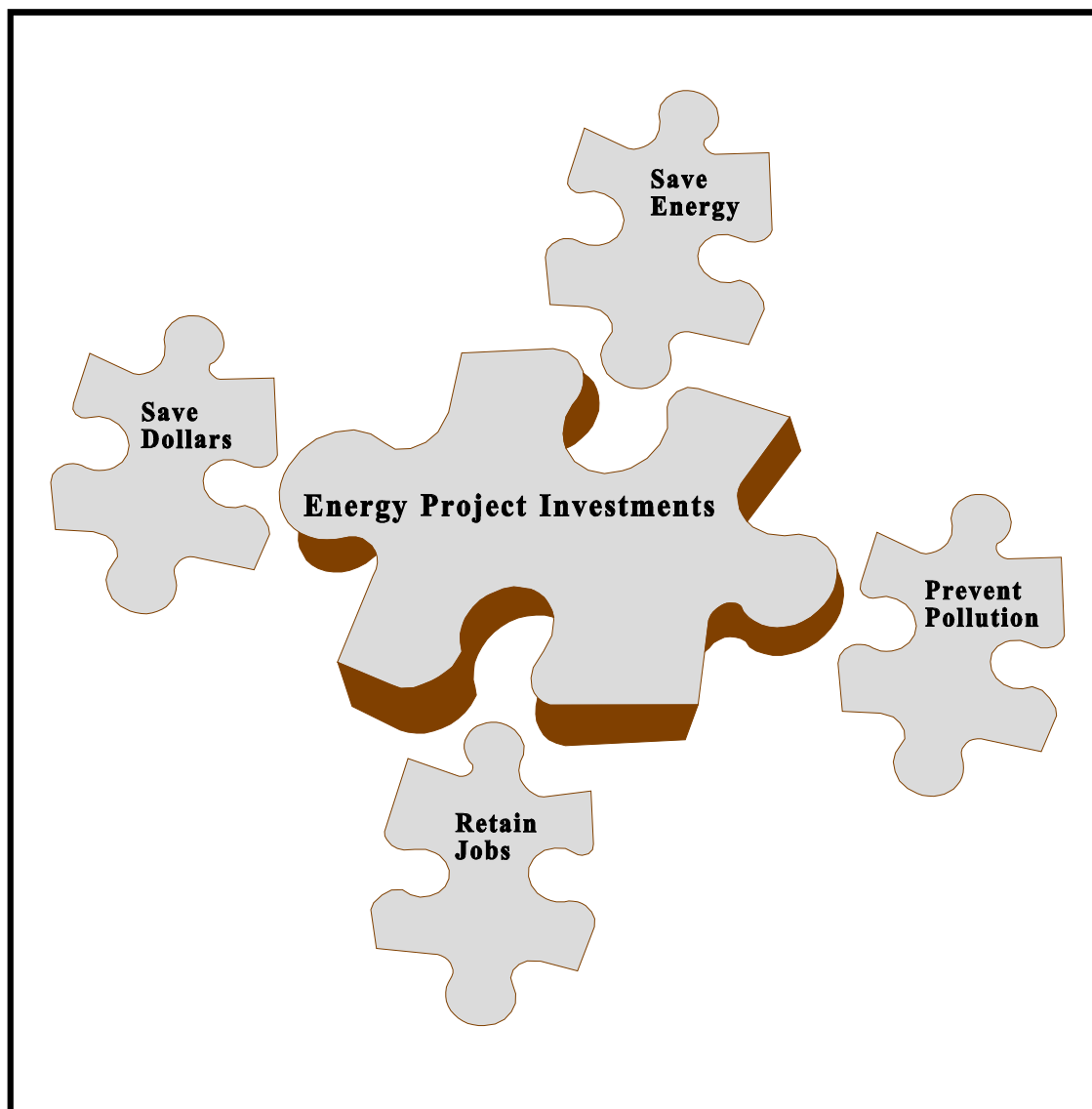
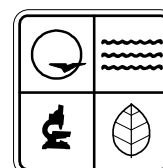


Application Forms and General Information for
Energy Loan Program Funds
*for the design, equipment and installation
related to implementation of an*
Energy Efficiency or Renewable Energy Project



Offered by the Missouri
Department of Natural Resources
Energy Center



PUB001223



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Energy Loan Program

Application Forms and General Information

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Energy Loan Program

General Information and Application Forms

Energy Center Mission Statement

Given that energy is a primary influence on Missouri's ability to develop and sustain prosperity, environmental integrity and social equity:

The Energy Center serves Missouri citizens, public agencies, institutions, businesses and industries... supporting energy efficiency and renewable energy initiatives with reliable public information, technical assistance and financial investment, and supporting policy makers with energy policy research and analysis.

ELP Background

The Energy Loan Program (ELP) was established to facilitate a long-term solution to rising energy costs for schools and local governments through increased efficiency. In addition, the ELP is part of the mechanism of providing court-ordered restitution to injured consumers created through oil-overcharges that occurred during the 1970's. The Department of Natural Resources' Energy Center (DNR/EC) established a Public School Loan Fund for K-12 schools in 1989. As the success of this program was recognized, a similar program was established for local governments in 1990. In 1995, the General Assembly passed a law consolidating the loan fund accounts and eligibility. In addition, the DNR/EC may broaden the eligibility by administrative rule and facilitate the development of public/private partnerships relating to energy efficiency and renewable energy projects.

Purpose of Funds

The purpose of the ELP funds is to facilitate implementation of energy conservation projects by providing a source of capital at, or below, market rates of interest. An energy conservation project is defined as one or more energy conservation measures proposed or implemented on an energy using system, including initial installation in a new building, primarily intended to maintain or reduce energy consumption or allow for the use of an alternative or renewable energy source and reduce energy costs.

Implementing energy conservation projects can reduce energy costs, save energy supply, prevent environmental pollution, create or retain jobs and improve the comfort and safety of building occupants or energy system users. For the long-term, the ELP is expected to play a significant role in developing public/private partnerships that can provide a vast amount of investment capital and a wealth of technical assistance regarding energy projects.

Accomplishments

As of September 2002, reporting indicates that public schools and local governments have saved over \$7.3 million annually in energy costs since ELP funds were made available. To accomplish the savings, more than 330 public schools and local governments have received over \$38 million to implement projects with an average payback of 5.2 years. Moreover, the ELP has important indirect benefits. As the realized

savings generate the revenues to payback the energy loan, a neutral effect on cash flow exists for the implementing organization. Therefore, ELP repayments for energy projects are considered “off budget” and are not considered as general debt obligations. Following loan payback the implementing organization continues to receive the project savings for the remainder of the project’s useful life creating other investment opportunities.

General Eligibility

Missouri public schools K-12 and local governments are currently eligible to apply for loan funds to finance implementation of energy conservation projects. The applicant must own and operate the building, facility or system associated with the proposed project unless otherwise agreed to by the DNR/EC. Further, the building, facility or system must have an expected operational life greater than the project’s loan repayment period. The applicant must be in compliance with all applicable federal, state or local laws, ordinances and rules and must not be in default or have a pending event of default regarding any previous loan with the DNR.

An energy project may include costs for design, acquisition, installation, commissioning and other associated project costs determined by the department as eligible. An energy conservation project, proposed for loan approval, must be identified in a Technical Assistance Report (TAR) or TAR Equivalent and must accompany the loan fund application. The material beginning on page 11 provides additional information regarding the use and content of a TAR or TAR equivalent.

Qualified energy analysts are required to complete the more comprehensive TAR. DNR/EC maintains a list of qualified analysts and furnishes each analyst with copies of the “Technical Energy Study Procedures Manual.” The manual contains the requirements of a TAR and provides guidance for completion. Questions regarding the procurement of professional energy analysts should be directed to the Energy Technical Assistance Program’s Engineering Services Section.

The DNR/EC desires to make funds for energy project implementation as accessible as possible. Generally, proposed projects are eligible for eight (8) times the estimated savings or the estimated project cost, whichever is lower, subject to approval by DNR/EC. Applications for funds can be submitted anytime, unless competitive application cycles with specific opening and closing dates are required.

The balance and availability of loan funds will guide the need for competitive application cycles. Should competitive cycles become necessary, DNR/EC will make cycle information available to the public through the “In Addition” section of the *Missouri Register* and through other appropriate media.

A DNR/EC project developer may be contacted at (573) 751-3443 or 1-800-361-4827 anytime there are eligibility or other questions. You may also write to the Energy Center’s Energy Loan Program, Program Clerk, P.O. Box 176, Jefferson City, MO 65102.

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Application Forms

Energy Loan Program

Application Completion Instructions

Please be as thorough as possible when completing your application and associated documents. Should you need additional copies of the application forms or assistance, contact the Schools and Governments Program at (573) 751-3443 or 1-800-361-4827. Deficiencies in the application will delay application review and may disqualify the project from an applicable review cycle.

The following is provided to assist in completion of the application form that follows on page 9. Clearly mark the box for the type of application you are submitting, i.e., School K-12, Local Government or Other with additional specification. Complete the numbered application blocks using the corresponding numbered instructions as guidance.

1. Enter the legal name of your organization.
2. Leave blank.
3. Leave blank.
4. Enter the street or P.O. Box address of your organization's administrative office.
5. Enter the city where your organization's administrative office is located.
6. Enter the corresponding zip code.
7. Enter the county where your organization's administrative office is located.
8. Enter your state vendor number. (If you do not know your number, leave it blank).
9. Enter your Federal Tax Identification number.
10. Enter the contact person's name. (The contact person is the individual who can answer the majority of questions related to this application).
11. Enter the contact person's title.
12. Enter contact person's telephone number, including area code and extension.
13. Enter contact person's facsimile number, including area code and extension.
14. Check the appropriate box for the project type, i.e., building, facility or system.
15. Enter the total gross square feet of the individual building or facility.
16. Enter the total square feet of the individual building or facility that is heated space.

17. Enter the total square feet of the individual building or facility space conditioned by cooling.
18. Enter the legal name of the individual building, facility or system if applicable. (Each building proposed to receive individual ECMs requires a separate application package.)
19. Leave blank.
20. Enter the street address when different from item 4, otherwise state "same as above."
21. Enter the city when different from item 5, otherwise state "same as above."
22. Enter the zip if different from item 6, otherwise state "same as above."
23. Enter date that initial construction of the individual building was completed.
24. Enter the total of all ECM costs.
25. Enter the total of all ECM requested loan amounts.
26. Check the appropriate box for the type of analysis documentation supporting the application, i.e., Technical Assistance Report (TAR) or TAR Equivalent.
27. Enter the name of the energy analyst that prepared the TAR or the name of the person who prepared the TAR Equivalent.
28. Enter the engineer's professional registration number that approves the TAR or leave blank if not applicable.
29. Enter the name of your utility(s) or other suppliers of energy.
- 30-35. Enter the appropriate congressional and legislative districts for your organization's administrative offices and the individual building, facility or system.
36. Enter the projected date of design completion. (Allow for any competing projects that may delay this project.)
37. Enter the projected acquisition date of material or equipment. (Allow for any competing projects that may delay this project.)
38. Enter the planned project completion date. (Allow for any competing projects that may delay this project.)

APPLICATION AUTHORIZATION

Check the appropriate box regarding building, facility or system ownership. Type or print the official's name and title authorized to be signatory to contract documents on behalf of your organization. Obtain the authorized official's signature following his/her careful review.

APPLICATION PAGE 2 - ECM APPLICATION SUMMARY

The following is provided to assist the completion of the ECM Application Summary form that follows on page 11. The location of this information is relevant to the submission of a Technical Assistance Report (TAR) or TAR equivalent with the application. The guidance associated to the form blanks are:

ECM Number. The ECM number should correspond with the ECM number in the TAR ECM Summary Report, form DNR/TES 8.2. If using a TAR equivalent, the ECM(s) should be numbered in ascending order beginning with one.

ECM Title. The ECM title should correspond with the ECM title in the TAR ECM Summary Report, form DNR/TES 8.2. If using a TAR equivalent, the ECM(s) should be titled relevant to one of the six worksheets described on page 18 (i.e., wall or ceiling insulation, pipe insulation, setback thermostat, lighting, window replacement or heating plant replacement).

Design Cost. Transfer the associated ECM design cost from the TAR ECM Summary Report, form DNR/TES 8.2 under section I. A. If using the TAR equivalent, transfer the cost from the ECM Cost Estimate form, page 41 of this document.

Labor, Material and Total Costs. Use the same method described for design cost except referring to the appropriate labor, material and total cost sections.

Loan Amount Requested. The DNR/EC will consider a loan request for the estimated ECM cost or up to eight times the estimated annual savings whichever is less.

Fuel Type. Refer to the TAR ECM Summary Report, form DNR/TES 8.2 under section V - Energy Savings, for this information. If using the TAR equivalent, you must determine the type of fuel relevant to the energy savings. Enter the appropriate abbreviation letter for the relevant fuel type from the table on page 19 of this document.

Other Savings. Refer to the TAR ECM Summary Table, form DNR/TES 8.0 under the “Other Cost Savings” column. If using a TAR equivalent, ignore this entry.

Energy Savings (expressed in dollars). Refer to the TAR ECM Summary Report, form DNR/TES 8.2 under section VI - Energy Cost Savings, for this information. If using the TAR equivalent, you will need to retrieve this information from the appropriate worksheet under “Annual Savings”.

FUEL USE SUMMARY

Complete the Fuel Use Summary form on page 13 by entering the fuel costs from the utility bills of the most recent 12 month period for each building, facility or system proposed to receive loan funds for ECM implementation. Record the year relevant to the month as appropriate in the YEAR column. The costs should be entered under the Cost column for the appropriate energy source or fuel type, i.e., Electric; Natural Gas; Fuel Oil, L.P. Gas or Other. When more than one utility bill is received for a fuel type, the summed amount should be entered for each month.

Under each fuel type is a Usage per Unit column. For electricity the unit is kilowatts hours (KWH). Natural Gas units are generally expressed in Therms or CCF (one hundred cubic feet). Indicate which unit you are expressing. Units of fuel oil and L. P. gas are generally expressed in gallons. Other units may be tons as in coal, cords as in wood, etc. Indicate which unit you are expressing when applicable.

The Annual Total and Average Unit Cost rows should be computed and entered in the appropriate spaces provided. All relevant billing account numbers are to be entered.

The Fuel Use Summary form may be reproduced as needed. Please contact the Schools and Governments Program at (573) 751-3443 or 1-800-361-4827 if you have any questions on how to complete this form.

Mail the completed application and associated documents to the:

**Department of Natural Resources
Energy Center
Attn.: Energy Loan Program, Program Clerk
P.O. Box 176
Jefferson City, MO 65102**

or, in case of hand delivery, the center's street address is 1659 East Elm Street, Jefferson City, MO.

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
ENERGY CENTER - ENERGY LOAN PROGRAM
LOAN APPLICATION

Shaded Areas for
Department Use Only

Type of Application: <input type="checkbox"/> School K-12 <input type="checkbox"/> Local Government <input type="checkbox"/> Other - Specify _____			
1. APPLICANT/ORGANIZATION NAME		2. ADJUSTMENT	3. LOAN AMOUNT \$
4. MAILING ADDRESS	5. CITY	6. ZIP CODE	7. COUNTY
8. STATE VENDOR NUMBER		9. FEDERAL IDENTIFICATION NUMBER	
10. CONTACT NAME	11. TITLE	12. PHONE NUMBER	13. FAX NUMBER
14. PROJECT TYPE <input type="checkbox"/> Building <input type="checkbox"/> Facility <input type="checkbox"/> System	15. TOTAL SQUARE FEET	16. TOTAL HEATED SQUARE FEET	17. TOTAL COOLING SQUARE FEET
18. BUILDING, FACILITY OR SYSTEM NAME		19. PROJECT ID NUMBER	
20. ADDRESS OF BUILDING, FACILITY OR SYSTEM	21. CITY	22. ZIP CODE	
23. YEAR BUILDING CONSTRUCTION COMPLETED	24. TOTAL PROJECT COST	25. TOTAL LOAN AMOUNT REQUESTED	
26. TYPE OF ENERGY ANALYSIS <input type="checkbox"/> TAR <input type="checkbox"/> TAR EQUIVALENT	27. ENERGY ANALYST OR OTHER REPORT PREPARER	28. PROFESSIONAL ENGINEER NUMBER E _____	
29. Type of Reviewer <input type="checkbox"/> Engineer <input type="checkbox"/> ESCO <input type="checkbox"/> Site <input type="checkbox"/> Other _____		30. LIST THE NAME OF YOUR UTILITY(S) OR ENERGY SUPPLIER(S)	
	@ Applicant's Location	@ Project Address	
U.S. Congressional District	31. _____	32. _____	
Mo. Senatorial District	33. _____	34. _____	
Mo. Legislative District	35. _____	36. _____	
Planned Project Milestones			
37. DESIGN COMPLETION DATE	38. MATERIAL/EQUIPMENT ACQUISITION DATE	39. PROJECT COMPLETION DATE	
	Application Authorization		
<p>The governing board or body has reviewed the technical assistance report or equivalent and agrees that the building, facility or system information is correct and the project and associated energy conservation measures have been correctly described. The governing board or body authorizes the contact person, named above, to provide any additional information relevant to the review and/or approval of this application.</p> <p>The building, facility or system is owned and operated by the applicant. <input type="checkbox"/> Yes <input type="checkbox"/> No</p>			
TYPE OR PRINT NAME OF AUTHORIZED OFFICIAL	TITLE	SIGNATURE OF AUTHORIZED OFFICIAL	DATE

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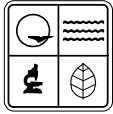
ECM Application Summary

ECM NUMBER		ECM TITLE		DE ENGINEERING USE ONLY		ECM CODE	
DESIGN COST		\$		DESIGN COST		\$	
LABOR COST		\$		LABOR COST		\$	
MATERIAL COST		\$		MATERIAL COST		\$	
TOTAL ECM COST		\$		LOAN AMOUNT REQUESTED		\$	
SAVINGS:		Other Savings		\$			
Fuel Type_____		Energy Savings		\$			
Fuel Type_____		Energy Savings		\$			
Fuel Type_____		Energy Savings		\$			
Total Savings		\$					

ECM NUMBER		ECM TITLE		DE ENGINEERING USE ONLY		ECM CODE	
DESIGN COST		\$		DESIGN COST		\$	
LABOR COST		\$		LABOR COST		\$	
MATERIAL COST		\$		MATERIAL COST		\$	
TOTAL ECM COST		\$		LOAN AMOUNT REQUESTED		\$	
SAVINGS:		Other Savings		\$			
Fuel Type_____		Energy Savings		\$			
Fuel Type_____		Energy Savings		\$			
Fuel Type_____		Energy Savings		\$			
Total Savings		\$					

ECM NUMBER		ECM TITLE		DE ENGINEERING USE ONLY		ECM CODE	
DESIGN COST		\$		DESIGN COST		\$	
LABOR COST		\$		LABOR COST		\$	
MATERIAL COST		\$		MATERIAL COST		\$	
TOTAL ECM COST		\$		LOAN AMOUNT REQUESTED		\$	
SAVINGS:		Other Savings		\$			
Fuel Type_____		Energy Savings		\$			
Fuel Type_____		Energy Savings		\$			
Fuel Type_____		Energy Savings		\$			
Total Savings		\$					

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
ENERGY CENTER - ENERGY LOAN PROGRAM
FUEL USE SUMMARY

ORGANIZATION NAME	
BUILDING, FACILITY OR SYSTEM	CURRENT BUILDING AREA IN SQUARE FEET

Month	YEAR	ELECTRIC		NATURAL GAS		FUEL OIL / L.P. / OTHER _____	
		Cost	Usage (KWH)	Cost	Usage (_____)	Cost	Usage (_____)
July							
August							
September							
October							
November							
December							
January							
February							
March							
April							
May							
June							
Annual Total							
Average Unit Cost							
Account Numbers						N/A	

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Technical Assistance Report Equivalent

General Information
&
Worksheets

Technical Assistance Report Equivalent General Information & Completion Instructions

The Energy Center promotes the concept of total energy management to maximize energy savings. Total energy management needs the support of a comprehensive energy analysis of a facility's energy using systems. This comprehensive energy analysis is labeled by law as a Technical Assistance Report (TAR). A TAR is defined as a specialized engineering report that identifies and specifies the quantity of energy savings and related energy cost savings that are likely to result from the implementation of one or more energy conservation or renewable energy measures.

The TAR Equivalent is an abbreviated Technical Assistance Report to qualify measures for loan approval that have been proven cost-effective over time and do not require a more comprehensive analysis. Before opting for a TAR Equivalent the applicant should consider the advantages of the comprehensive TAR. They are as follows:

- The TAR provides the institution with a detailed description of its present physical plant, energy use characteristics and procedures, potential operation and maintenance changes (O&M), and potential capital improvements associated with ECMs. The report is intended to be a long-term energy management and energy planning document that guides those responsible for energy and financial management.
- The TAR accurately determines where the various facility energy inputs are consumed over a twelve-month base year period. This allows the analyst to focus attention on the energy systems with the most potential for savings. The ECM can then be modeled and compared to the base year to obtain a good estimate of the potential savings associated with given energy conservation measures.
- The TAR accurately describes the energy conservation measures, documents the cost estimates, and documents the energy and cost savings associated with proposed O&M improvements, ECMs, or renewable energy measures.
- The TAR accurately documents the interaction of proposed groups of ECMs and O&Ms so that savings are not overestimated.
- The TAR provides the institution with an analytical model which can be used to specify air flows to spaces, identify when spaces will not meet temperature design specifications, and accurately size fan and pump motors and cooling and heating equipment. This model serves as a current and future reference to predict the energy use results associated with any building or system change.

Heating, Ventilation and Air Conditioning (HVAC) controls as an ECM or any combination of HVAC measures that exceed a cost of \$20,000 require a full Technical Assistance Report. Moreover, unusual conditions may warrant DNR/EC to require a comprehensive TAR.

Although total energy management is the preference of the Energy Center, implementing simple cost effective projects with short-term payback may be an effective and desired strategy for some organizations. The Energy Center provides a TAR Equivalent for this purpose.

At minimum, the TAR Equivalent must include the following completed forms: TAR Equivalent Cover Sheet, Building Description (if applicable), applicable ECM Worksheets, ECM Description and the ECM

Cost Estimate documenting material, labor, design, in-kind and any contingency costs. Other hand calculations or spreadsheets for simple ECMs may be accepted on a case-by-case basis. Modeling is not required when a TAR Equivalent is appropriate.

There are six types of ECM worksheets developed to be part of the TAR Equivalent package. These worksheets are consistent in format and provide line by line instructions to guide in their completion. The worksheets with a brief description are as follows:

- The Wall or Ceiling Insulation worksheet is used to compute the savings for an area to be insulated that has a uniform R-value over the entire area and in which the R-value to be added will be applied uniformly over this same area. If the R-value is not the same in all areas of the building or different R-values will be added to separate areas of the building, a worksheet must be used for each of the individual areas.
- The Pipe Insulation worksheet is used to compute the savings for heating pipes that serve radiators or fan coil units. Furnace rooms, crawlspaces, unheated areas and overheated rooms are typical for effective insulation applications. A Heat Loss Factor Table follows the insulation worksheet for reference.
- The Programmable Setback Thermostat worksheet is used to compute savings as a result of setting the heating thermostat to a lower value during a building's unoccupied hours.
- The Lighting Upgrade worksheet is used to compute the savings from a reduction in the number of lamps, lamp or ballast wattage, hours of use per year or a change out to new efficient fixtures.
- The Window Replacement worksheet is used to compute the savings from replacing inefficient windows with more efficient models or for the addition of storm windows. Reduced infiltration and improved U-values are included in the worksheet's computation method.
- The Heating Plant Replacement worksheet is used to compute the savings when installing a new more efficient furnace or boiler or when changing the energy sources used for heating. Sizing the system to more closely match the heating load should be considered and may require engineering analysis. ECMs that reduce the overall heat load, such as insulation or window replacement, should be considered in conjunction with heating plant replacement. Efficiency of an old heating plant is assumed at a minimum of 65 percent unless field-tested.

The worksheets require the cost of the project, therefore contractor quotes or other accurate cost estimates must be used as a basis for ECM costs. Contractors or other qualified persons experienced in building trades such as electrical, heating, etc., may be necessary consultants to assist in the completion of the worksheets. The worksheets are designed to provide conservative estimates of savings using a generalized computation approach. If more precise results are desired, or if operation and maintenance savings are desired for inclusion in the project savings estimates, other more sophisticated computation methods should be used.

All required entries are described at the top of each worksheet. The right column of blanks is for the entries. The left column of blanks represent the results of computations. The table below contains information for the various fuels necessary to compute the cost of a million Btu (MMBtu) for each fuel.

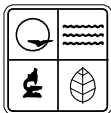
To use the table, find the relevant fuel type, determine the cost per unit of that fuel and multiply by the appropriate conversion number to obtain the cost per MMBtu.

Fuel Type	Abbreviation	Multiply	By	To Obtain
Electricity	E	\$/Kwh	293	\$/MMBtu
Natural Gas	NG	\$/Therm	10.0	\$/MMBtu
Natural Gas	NG	\$/CCF	10.0	\$/MMBtu
Propane	LPG	\$/Gallon	10.9	\$/MMBtu
Oil	Oil	\$/Gallon	7.2	\$/MMBtu
Coal	Coal	\$/Ton	0.045	\$/MMBtu
Wood	Wood	\$/Cord	0.045	\$/MMBtu

There are two additional parts that complete the TAR Equivalent package. First, is the ECM Description form. This form is provided to indicate the format the applicant should use to describe each ECM proposed to receive loan funds. Copy the form as needed, or the format may be duplicated using a word processing or similar computer program and filling in the relevant information. Sufficient detail should be provided to clearly describe the existing and proposed systems, upgrades or replacements to facilitate the ECM energy savings calculation by an engineer and the ECM total cost estimation.

Second, is the ECM Cost Estimate form. This form is used to accurately estimate the cost of the ECMs for which loan funds are requested. The applicant may use this form or may substitute for this form with a similar format that provides sufficient information to detail the cost of each ECM. Bids or firm quotes from contractors may also be used for the ECM cost estimate requirement.

Please contact the Schools and Governments Program at (573) 751-3443 or 1-800-361-4827 if you have any questions on how to complete the worksheets or any other part of the TAR Equivalent package.



MISSOURI DEPARTMENT OF NATURAL RESOURCES
ENERGY CENTER - ENERGY LOAN PROGRAM
TAR EQUIVALENT COVER SHEET

I. BUILDING, FACILITY OR SYSTEM OWNER

BUILDING, FACILITY OR SYSTEM NAME

ADDRESS

CITY

ZIP CODE

OWNERS NAME

OWNERS MAILING ADDRESS

CITY

ZIP CODE

CONTACT PERSON

TELEPHONE

II. WORKSHEET PREPARER

NAME

REGISTRATION NUMBER (IF APPLICABLE)

AFFILIATION

ADDRESS

CITY

ZIP CODE

TELEPHONE

WORKSHEET PREPARER SIGNATURE

DATE

REMARKS

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
ENERGY CENTER - ENERGY LOAN PROGRAM

BUILDING DESCRIPTION

(USE SEPARATE SHEETS AS REQUIRED)

BUILDING NAME	ESTIMATED USEFUL LIFE
---------------	-----------------------

- BUILDING SIZE & OCCUPANCY -

Total Building Area:	Gross Square Feet	Number of People in Building:
Eligible Building Area:	Gross Square Feet	

- CONSTRUCTION HISTORY -

TYPE	Year	Heated	Cooled
Original		Sq. Ft.	Sq. Ft.
Addition 1		Sq. Ft.	Sq. Ft.
Addition 2		Sq. Ft.	Sq. Ft.
Addition 3		Sq. Ft.	Sq. Ft.
Addition 4		Sq. Ft.	Sq. Ft.

- EXISTING OPERATING SCHEDULE OF BUILDING & EQUIPMENT -

Building Schedule	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Winter Months							
Starting Time (circle a.m. or p.m.)							
Hours Maintained (No. of hours)							
Summer Months (if different)							
Starting Time (circle a.m. or p.m.)							
Hours Maintained (No. of hours)							
Other Information							
Occupied Temperature	Winter	°F	Summer	°F			
Unoccupied Temperature	Winter	°F	Summer	°F			
Boiler or Furnace Efficiency	% (circle AFUE or combustion)			Heating Month On:	Off:		
Cooling System COP (Coefficient of Performance)				Cooling Month On:	Off:		

- PROPOSED OPERATING SCHEDULE OF BUILDING & EQUIPMENT -

Building Schedule	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Winter Months							
Starting Time (circle a.m. or p.m.)							
Hours Maintained (No. of hours)							
Summer Months (if different)							
Starting Time (circle a.m. or p.m.)							
Hours Maintained (No. of hours)							
Other Information							
Occupied Temperature	Winter	°F	Summer	°F			
Unoccupied Temperature	Winter	°F	Summer	°F			
Boiler or Furnace Efficiency	% (circle AFUE or combustion)			Heating Month On:	Off:		
Cooling System COP (Coefficient of Performance)				Cooling Month On:	Off:		

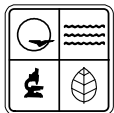
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MISSOURI DEPARTMENT OF NATURAL RESOURCES
ENERGY CENTER - ENERGY LOAN PROGRAM
WALL OR CEILING INSULATION WORKSHEET

BUILDING	LOCATION	DATE																																	
CHECK THE TYPE OF INSULATION PROJECT UNDER CONSIDERATION																																			
<p>To estimate the savings of adding insulation to the ceiling or wall, the following information must be known:</p> <p>The area to be insulated in square feet. The old R-value. The new total R-value. The heating plant efficiency (in percent). (Check nameplate or with contractor). The heating energy cost (\$/million Btu).</p>																																			
SAVINGS CALCULATIONS																																			
<table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 5%; text-align: right;">1.</td><td style="width: 75%;">Enter the old R-value</td><td style="width: 20%; border-bottom: 1px solid black;"></td></tr><tr><td>2.</td><td>Enter the new total R-value</td><td style="border-bottom: 1px solid black;"></td></tr><tr><td>3.</td><td>Subtract line 1 from line 2</td><td style="border-bottom: 1px solid black;"></td></tr><tr><td>4.</td><td>Multiply line 1 by line 2</td><td style="border-bottom: 1px solid black;"></td></tr><tr><td>5.</td><td>Divide line 3 by line 4</td><td style="border-bottom: 1px solid black;"></td></tr><tr><td>6.</td><td>Enter the area to be insulated (square feet)</td><td style="border-bottom: 1px solid black;"></td></tr><tr><td>7.</td><td>Multiply line 5 by line 6</td><td style="border-bottom: 1px solid black;"></td></tr><tr><td>8.</td><td>Enter the heating plant efficiency (percent divided by 100)</td><td style="border-bottom: 1px solid black;"></td></tr><tr><td>9.</td><td>Divide line 7 by line 8</td><td style="border-bottom: 1px solid black;"></td></tr><tr><td>10.</td><td>Divide line 9 by 10.0</td><td style="border-bottom: 1px solid black;"></td></tr><tr><td>11.</td><td>Enter the energy cost (\$/million Btu)</td><td style="border-bottom: 1px solid black;"></td></tr></table>			1.	Enter the old R-value		2.	Enter the new total R-value		3.	Subtract line 1 from line 2		4.	Multiply line 1 by line 2		5.	Divide line 3 by line 4		6.	Enter the area to be insulated (square feet)		7.	Multiply line 5 by line 6		8.	Enter the heating plant efficiency (percent divided by 100)		9.	Divide line 7 by line 8		10.	Divide line 9 by 10.0		11.	Enter the energy cost (\$/million Btu)	
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ANNUAL SAVINGS																																			
<table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 5%; text-align: right;">12.</td><td style="width: 60%;">Multiply line 10 by line 11</td><td style="width: 35%; text-align: right;">\$ _____ /year</td></tr></table>			12.	Multiply line 10 by line 11	\$ _____ /year																														
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PROJECT COST																																			
<table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 5%; text-align: right;">13.</td><td style="width: 75%;">Enter the total cost to insulate the area including material, labor and design</td><td style="width: 20%; text-align: right;">\$ _____</td></tr></table>			13.	Enter the total cost to insulate the area including material, labor and design	\$ _____																														
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SIMPLE PAYBACK																																			
<table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 5%; text-align: right;">14.</td><td style="width: 60%;">Divide line 13 by line 12</td><td style="width: 35%; text-align: right;">_____ years</td></tr></table>			14.	Divide line 13 by line 12	_____ years																														
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MISSOURI DEPARTMENT OF NATURAL RESOURCES
ENERGY CENTER - ENERGY LOAN PROGRAM
PIPE INSULATION WORKSHEET

BUILDING	LOCATION	DATE
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To estimate the savings of adding insulation to the outside of heat distribution pipes, the following information must be known:

The interior pipe diameter.
The total length (feet) of pipe to be insulated.
The pipe fluid temperature (°F).
The pipe room temperature (°F).
The hours of use per day.

Bare pipe heat loss factor (Use Heat loss Factor Table).
Thickness of added insulation.
Insulated pipe heat loss factor (Use Heat loss Factor Table).
Heating plant efficiency (in percent).
The energy cost (\$/million Btu).

SAVINGS CALCULATIONS

1. Enter the bare pipe heat loss factor _____
2. Enter the insulated pipe heat loss factor _____
3. Subtract line 2 from line 1 _____
4. Enter the pipe fluid temperature (degrees F) _____
5. Enter the pipe room temperature (degrees F) _____
6. Subtract line 5 from line 4 _____
7. Enter the total length (feet) of pipe to be insulated _____
8. Enter the hours of use per year _____
9. Multiply line 3 by line 6 by line 7 by line 8 then divide by 1,000,000 _____
10. Enter the heating plant efficiency (percent divided by 100) _____
11. Divide line 9 by line 10 _____
12. Enter the energy cost (\$/million Btu) _____

ANNUAL SAVINGS

13. Multiply line 11 by line 12 \$ _____ /year

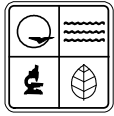
PROJECT COST

14. Enter the total cost to insulate the pipe including material, labor and design \$ _____

SIMPLE PAYBACK

15. Divide line 14 by line 13 _____ years

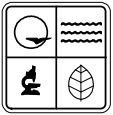
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MISSOURI DEPARTMENT OF NATURAL RESOURCES
 ENERGY CENTER - ENERGY LOAN PROGRAM
HEAT LOSS FACTOR TABLE (Reference for Pipe Insulation Worksheet)

INTERIOR PIPE DIAMETER	BARE PIPE FACTOR	INSULATED PIPE FACTOR						
		INSULATION THICKNESS (INCHES)						
		½	¾	1	1 ¼	1 ½	1 ¾	2
½	0.63	0.163	0.135	0.116	0.105	0.098	0.091	0.086
¾	0.76	0.191	0.155	0.135	0.120	0.110	0.103	0.096
1	0.93	0.211	0.179	0.153	0.136	0.125	0.115	0.108
1 ¼	1.14	0.263	0.210	0.178	0.158	0.143	0.132	0.122
1 ½	1.27	0.287	0.232	0.194	0.172	0.154	0.142	0.132
2	1.53	0.345	0.271	0.229	0.198	0.178	0.163	0.151
2 ¼	1.87	0.425	0.325	0.270	0.237	0.210	0.190	0.175
3	2.15	0.487	0.368	0.309	0.251	0.214	0.211	0.195
4	2.65	0.600	0.447	0.375	0.305	0.279	0.252	0.231
5	3.20	0.663	0.500	0.407	0.346	0.305	0.271	0.245
6	3.70	0.852	0.628	0.536	0.432	0.379	0.341	0.305
8	4.75	1.090	0.828	0.650	0.549	0.486	0.433	0.388
10	5.75	1.341	0.990	0.778	0.678	0.580	0.511	0.457
12	6.75	1.550	1.152	0.920	0.802	0.664	0.604	0.541

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
ENERGY CENTER - ENERGY LOAN PROGRAM
PROGRAMMABLE SETBACK THERMOSTAT WORKSHEET

BUILDING	LOCATION	DATE
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To estimate the savings possible from a temperature reduction or night setback, the following information must be known:

The existing weekly operating hours when occupied.
The existing weekly operating hours when unoccupied.
The proposed weekly operating hours when occupied.
The proposed weekly operating hours when unoccupied.
The annual heating cost.

The existing weekly operating temperature when occupied.
The existing weekly operating temperature when unoccupied.
The proposed weekly operating temperature when occupied.
The proposed weekly operating temperature when unoccupied.

SAVINGS ESTIMATE

1.	Enter the existing weekly operating hours when occupied	_____
2.	Enter the existing weekly operating temperature when occupied	_____
3.	Multiply line 1 by line 2	_____
4.	Enter the existing weekly operating hours when unoccupied	_____
5.	Enter the existing weekly operating temperature when unoccupied	_____
6.	Multiply line 4 by line 5	_____
7.	Add line 3 to line 6	_____
8.	Enter the proposed weekly operating hours when occupied	_____
9.	Enter the proposed weekly operating temperature when occupied	_____
10.	Multiply line 8 by line 9	_____
11.	Enter the proposed weekly operating hours when unoccupied	_____
12.	Enter the proposed weekly operating temperature when unoccupied	_____
13.	Multiply line 11 by line 12	_____
14.	Add line 10 to line 13	_____
15.	Subtract line 14 from line 7	_____
16.	Multiply 0.0002 by line 15	_____

If the heating energy source is not used for any other purposes and the cost for heating the building is known, then skip lines 17 through 20 and enter the value on line 21. If the energy source supplies heating as well as other needs of the building, proceed with line 17.

17.	Total the seven energy bills that heating is included in from October through April and enter that amount	\$ _____
18.	Enter the amount of the May energy bill that heating is included in	\$ _____
19.	Multiply 7.0 by line 18	\$ _____
20.	Subtract line 19 from line 17 and ENTER THIS VALUE ON LINE 21 BELOW.	
21.	ANNUAL HEATING COST	\$ _____

ANNUAL SAVINGS

22.	Multiply line 16 by line 21	\$ _____ /year
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PROJECT COST

23.	Enter the total cost for the proposed project including material, labor and design	\$ _____
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SIMPLE PAYBACK

24.	Divide line 23 by line 22	_____ years
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MISSOURI DEPARTMENT OF NATURAL RESOURCES
ENERGY CENTER - ENERGY LOAN PROGRAM
LIGHTING UPGRADE WORKSHEET

BUILDING

LOCATION

DATE

To estimate the savings when more efficient lighting is installed, the following information must be known:

- The number of old fixtures being changed.
- The wattage of each old fixture.
- The number of new fixtures being installed.
- The wattage of each new fixture.
- The number of hours of use per year.
- The cost per kilowatt-hour of electricity.

SAVINGS CALCULATIONS

1. Enter the number of old fixtures being changed _____
2. Enter the wattage of the old fixture _____
3. Multiply line 1 by line 2 _____
4. Enter the number of new fixtures to be installed _____
5. Enter the wattage of each new fixture _____
6. Multiply line 4 by line 5 _____
7. Subtract line 6 from line 3 _____
8. Enter the hours of use per year _____
9. Multiply line 7 by line 8 _____
10. Divide line 9 by 1000 _____
11. Enter the cost per kilowatt hour of electricity _____

ANNUAL SAVINGS

12. Multiply line 10 by line 11 \$ _____ /year

PROJECT COST

13. Enter the total cost to modify the lighting including material, labor and design \$ _____

SIMPLE PAYBACK

14. Divide line 13 by line 12 _____ years

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
ENERGY CENTER - ENERGY LOAN PROGRAM
WINDOW REPLACEMENT WORKSHEET

BUILDING	LOCATION	DATE
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To estimate the savings of replacing existing windows with efficiency upgrades, the following information must be known:

- The U-Factor of the existing window (See U-Value table below).
- The U-Factor of the replacement window (See U-Value table below).
- The total area of the windows being replaced (square feet).
- The heating energy cost (\$/million Btu).
- The heating plant efficiency (in percent).

SAVINGS CALCULATIONS

1.	Enter the U-Factor of the existing windows.....	_____
2.	Enter the U-Factor of the replacement windows.....	_____
3.	Subtract line 2 from line 1	_____
4.	Add 0.86 to line 3	_____
5.	Enter the total area of the windows to be replaced.....	_____
6.	Multiply line 4 by line 5.....	_____
7.	Multiply 0.1 by line 6	_____
8.	Enter the heating plant efficiency (percent divided by 100)	_____
9.	Divide line 7 by line 8.....	_____
10.	Enter the energy cost (\$/million Btu).....	_____

YEARLY SAVINGS

11.	Multiply line 9 by line 10.....	\$ _____ /year
-----	---------------------------------	----------------

PROJECT COST

12.	Enter the total cost of the window replacement including material, labor and design.....	\$ _____
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SIMPLE PAYBACK

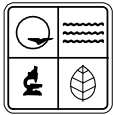
13.	Divide line 12 by line 11	_____ years
-----	---------------------------------	-------------

WINDOW U-VALUE TABLE

Window System Type	U-Factor*
Single Glass.....	1.10
Single Glass with storm window.....	0.50
Single Glass, low E coating	0.91
Single Glass, low E coating with storm window	0.44
Insulating Glass (double glass).....	0.55
Insulating Glass (double glass) with storm window	0.35
Insulating Glass (double glass), low E coating	0.38
Insulating Glass (double glass), low E coating with storm window	0.32
Insulating Glass (triple glass).....	0.35
Insulating glass (triple glass) with storm window	0.25

* U-Factor values adapted from the 1985 ASHRAE Fundamentals Handbook.

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
ENERGY CENTER - ENERGY LOAN PROGRAM
HEATING PLANT REPLACEMENT WORKSHEET

BUILDING	LOCATION	DATE
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To estimate the savings possible from a heating plant replacement that is intended to increase the efficiency and/or change energy sources, the following information must be known:

- The annual heating cost.
- The efficiency of the existing heating plant (in percent).
- The efficiency of the proposed heating plant (in percent).
- The existing energy cost (cost per million Btu).
- The proposed energy cost (cost per million Btu).

SAVINGS ESTIMATE

If the heating energy source is not used for any other purposes and the cost for heating the building is known, then skip lines 1 through 4 and enter that value on line 5. If the energy source supplies heating as well as other needs of the building, proceed with line 1.

1. Total the seven energy bills that heating is included in from October through April and enter that amount \$ _____
2. Enter the amount of the May energy bill that heating is included in \$ _____
3. Multiply 7.0 by line 2 \$ _____
4. Subtract line 3 from line 1 AND ENTER THIS VALUE ON LINE 5 BELOW.
5. ANNUAL HEATING COSTS \$ _____
6. Enter the efficiency of the existing heating plant (percent divided by 100) _____
7. Multiply line 5 by line 6 \$ _____
8. Enter the efficiency of the proposed heating plant (percent divided by 100) _____
9. Divided line 7 by line 8 \$ _____

If the proposed heating plant will use the same energy source as the existing one, skip lines 10 through 13 and enter the value from line 9 on line 14. If the energy sources for the proposed and existing plants are different, proceed with line 10.

10. Enter the existing energy cost (\$/million Btu) _____
11. Divided line 9 by line 10 _____
12. Enter the proposed energy cost (\$/million Btu) _____
13. Multiply line 11 by line 12 and ENTER THIS VALUE ON LINE 14 BELOW.
14. PROJECTED ANNUAL HEATING COSTS \$ _____

ANNUAL SAVINGS

15. Subtract line 14 from line 5 \$ _____ /year

PROJECT COST

16. Enter the total cost for the proposed project including material, labor and design \$ _____

SIMPLE PAYBACK

17. Divide line 16 by line 15 _____ years

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ECM DESCRIPTION

ECM No. _____

ECM Title: _____

Describe the existing system and the proposed ECM (use additional sheets if necessary):

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